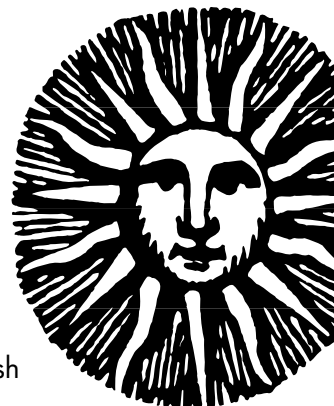


AUGUST 1997

10 WAYS TO SAVE ENERGY

As the temperature outside climbs with the summer sun, many of us are thankful that we work in modern, air-conditioned office buildings. There the temperature and humidity are controlled and the harsh sunlight is replaced with the constancy of overhead fluorescent lights. If you own or operate your own building or office space, the price for this comfort comes monthly in the form of your energy bill.

While everyone talks about saving energy, it is not an easy process. The idea of saving energy is akin to reducing our nation's debt, or reducing your taxes. Everyone agrees that it is a good idea, but no one is sure where to begin or how it can be accomplished. In this report, we suggest a number of methods and products that you can use to save both energy and money.



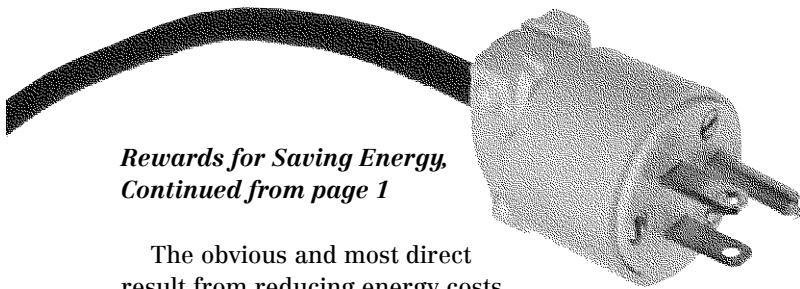
Rewards For Saving Energy

As a nation, we use a lot of energy. In fact, we have the highest energy use per capita in the world. In 1990, the US used more energy for air conditioning than China (with a population 4 times as large as ours) used for all of their energy needs. Our annual energy consumption, usually measured in hundreds of millions of barrels of oil equivalent, can astound the imagination. When confronted with such huge numbers, the idea of saving energy becomes abstract; after all, what can one person do? However, when you focus on more immediate objectives, such as reducing your costs, or making the air cleaner, the tasks associated with saving energy become easier to manage and understand.

Your Bottom Line — For businesses, utility expenditures are an accepted part of the price of doing business. Although most of us tend to think of energy costs in terms of fixed costs, this is certainly not the case. Your energy costs can be reduced, and the opportunities to reduce these costs abound.

Many energy-saving measures only require small investments and can pay for themselves in 1-2 years.

Continued on page 2



Rewards for Saving Energy, Continued from page 1

The obvious and most direct result from reducing energy costs is your bottom line — you pay less for energy, and the price of your services is reduced. If your building is more than 10 or 15 years old, the potential for reduction could be significant. Savings on the order of 10 to 25% for simple measures are possible. Completing more extensive measures could save you even more. Lighting upgrades, for example, can yield up to a 40% or more return on investment (ROI).

Our Environment — Monetary returns are not your only reward. Investing in energy efficiency can benefit the environment (e.g. by reducing the use of chlorofluorocarbon (CFC) and hydrochlorofluorocarbon (HCFC) gases), as well. We all take energy (in the form of electricity) for granted, but the consumption of fossil fuels can greatly harm the environment. Fossil fuel exploration and extraction processes, for example, scar the land and disrupt the oceans. The

burning of fossil fuels in order to generate energy

creates dangerous emissions that pollute the air we breathe and the water we drink. Using energy efficiently helps to reduce the need for such actions in ecologically important areas.

How to Start

Our experience shows that the next steps — identifying and implementing measures to conserve energy — are important ones, and that you should not choose to “go-it-alone.” Conserving energy requires a concerted effort from everyone. We suggest that you assemble a team from various areas of maintenance and administration to help set goals and define projects. We also suggest that whenever possible, everyone in your organization should be made aware of your efforts and how they can participate. Needless to say, if a project gets everyone’s support, its chances of success are much greater. Incentives, such as prizes and recognition when goals are met, can also go a long way to make undertakings more exciting and successful.

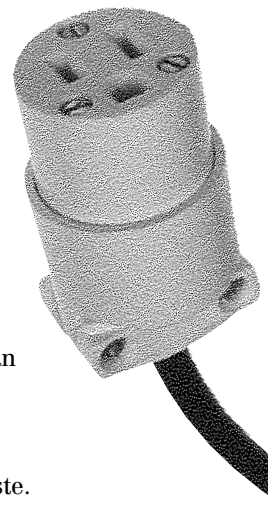
It never hurts to begin small, moving on to larger projects, as your experience and capacity grows. Maintenance practices are a good place to start if your building and systems are in reasonable shape. From there, you could move on to small retrofits, such as installing sensors and window films. After these projects are completed, you may want to evaluate existing systems to see if larger scale upgrades or retrofits make sense.

Why Maintenance?

Buildings are extremely complex systems of heating, cooling and electrical distribution. They hinge on the operation of small components (a lighting fixture or a pump, for example), which are integrated and then grouped into ever larger, more complex sub-systems and systems. Air handling or chiller units are examples of systems dedicated to serve a particular function.

Components and systems tend to stray from their intended operational state, and controls have a way of drifting away from their settings, just as an automobile gets out of tune. The consequence is less efficient operation, resulting in greater energy and operational costs. These effects sometimes reveal themselves through decreased performance. Reduced cooling capacity from a chiller or less light output from fixtures are just 2 examples of declining performance.

One surprising fact about maintenance is that very few facilities have processes in place to ensure energy-efficient operation. Most people assume that standard operating and maintenance practices will automatically result in energy efficiency. This is not the case. Experts estimate that most facilities needlessly waste 10 to 25% of the energy they purchase. Maintenance with a focus on energy savings means not only keeping things operational, but also operating at peak efficiency and only when needed. A teamwork approach can help to develop a thorough maintenance checklist that can save energy and reduce waste.



The **Choose Green Report** is published monthly for Green Seal Environmental Partners. To become an Environmental Partner, or to receive a copy of this report, contact Green Seal at (202) 588-8400 x 21 or lcarr@greenseal.org.

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10

TEN WAYS TO SAVE ENERGY

► **HVAC SYSTEMS** — Heating, ventilation, and air-conditioning (HVAC) equipment are large energy consumers for any type of building. Regular maintenance of HVAC equipment can help sustain system efficiency and avoid costly down time. An added benefit of a well-maintained HVAC system is better indoor air quality. Some suggested maintenance steps for HVAC equipment are listed below.

1 Maintain HVAC systems

- Clean permanent filters or change replaceable filters periodically.
- Check entire system annually for coolant and air leaks.
- Check entire system annually for clogs and obstructions of intakes, ducts and vents.

2 Check and clean units

- Check and clean filters periodically — once a month is preferable.

- Clean unit condensers at least every 2 or 3 years.

- Make sure the proper voltage and amperage are available to every unit.

3 Reduce unnecessary loads on the system

- Use blinds and shades to reduce outside heat transfer, especially with west- and south-facing windows.
- Turn off lights and appliances or other heat-producing equipment that is not in use, especially intense heat sources like incandescent or halogen lights.
- Position heat-producing appliances (TV, PC monitors, laser printers, copiers) in well-ventilated areas, away from thermostats. This will not only prevent heat build-up, it will also help to eliminate potential indoor air pollutants.
- Close all unnecessary openings and unoccupied areas.

► **OFFICE EQUIPMENT** — Office equipment such as computers, monitors, printers and copiers use a fair amount of energy while operating. Steps for reducing their energy consumption are listed below.

4 Ensure units function as intended

- Enable or activate equipment that is ENERGY STAR compliant. These machines are equipped with features that “power-down” or put idle equipment to “sleep” — a state that uses less energy. Some equipment shipped with this feature is already enabled. Others may require you to turn this feature on — you may wish to consult the manuals that came with the equipment for further information.

5 Use equipment wisely

- For copiers, this means setting your copier to duplexing (copy on

Continued on page 4

SOME ENERGY BASICS

kWh — Energy consumption (and pricing) is measured in kWh or kilowatt-hours. This is equivalent to 1000 watts (ten 100 W bulbs, for example) operating continuously for 1 hour. Energy pricing ranges from about 3¢ to 15¢ per kWh. In this report, we use 10¢ in our estimates.

Payback — Investments in energy efficiency are usually measured by their payback time. This is typically the amount of time it takes the savings to equal the initial cost. For example, a \$400 investment that

saves \$200 per year achieves payback in 2 years.

Emissions — The burning of fossil fuels to generate electricity and power equipment can result in the emission of a number of pollutants. These pollutants include particulate matter (fine dust from incomplete combustion of fossil fuels that is responsible for many respiratory ailments), sulfur dioxide (a gas responsible for acid rain and severe vegetation dieback), and carbon dioxide (a colorless, odorless gas

and a by-product of combustion that plays a role in global warming). The generation of one kWh of electricity can result in the release of 2 to 3 pounds of CO₂, while the combustion of a gallon of gasoline releases 20 pounds of this gas.

First cost — Most energy-efficient products tend to cost more than less efficient ones. While their initial cost, or purchase price, may be higher, their savings over time can more than make up the difference.

10 Ways to Save Energy, Continued from page 3

both sides) and making copies in batches whenever possible.

■ Turn equipment off when not in use — monitors, computers, printers and copiers can generate a lot of heat (and consume energy). Turning these off at night and when they are not in use will not damage them. Although these type of copiers may cost more initially, they will save energy and paper.

► **SMALL RETROFITS**—Not every energy conserving measure requires a large investment. A surprising number require only small investments of time and capital. Most can pay for themselves in 1 to 2 years.

Turn lights
and
equipment
off
when not
in use.
Install
occupancy
sensors.

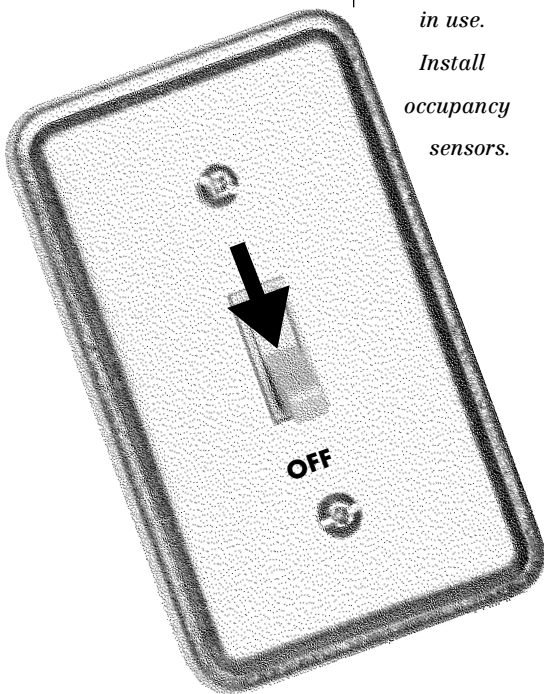


Table 1: Selected Caulk Products

COMPANY	PRODUCT	TYPE	VOC	CLEAN UP	DURABILITY
DAP	Energy Saver	acrylic/silicone	25 g/l	soap & water	~ 50 years
Darworth	Polyflex	silicone	28 g/l	soap & water	~ 50 years
Macco	Super Caulk LC	acrylic/silicone	40 g/l	soap & water	~ 35 years
OSI	Pro-Stik	vinyl	68 g/l	soap & water	~ 25 years
Wal-Mart	House Beautiful	acrylic	42 g/l	solvent	~ 15 years

NOTE: For a complete list of recommended caulk products, please refer to Green Seal's *Choose Green Report* on Building Sealing And Ventilation.

Table 2: Window Film Criteria

WINDOW TYPE/LOCATION	SOLAR HEAT GAIN COEFFICIENT	VISIBLE LIGHT TRANSMISSION COEFFICIENT	FILMS MEETING THESE REQUIREMENTS WILL...
Temperate or Mixed Climate	0.5 to 0.65	No less than 0.7	Provide daylight and view with insulation
Hot Climate or South and West facing Windows	0.5 or less	No less than 0.7	Provide solar control and/or UV protection
MANUFACTURERS OF WINDOW FILMS:			
Courtaulds Performance Films	.....	800-248-0822	
3M Construction Markets	.....	800-248-0822	
Guardian Industries	.....	800-521-9040	
Southwall Technologies	.....	800-365-8794	
ITD Metallized Products Inc.	.....	800-777-1770	

One of the keys to success for these small retrofits is vigilance. You need to identify areas and machinery that are not frequently used (such as loading docks, copiers, printers), have irregular use patterns, or have users that are not often in control of the equipment (libraries, file rooms, etc.). Lighting and office equipment are the most common

culprits. Areas where too little or too much external light or heat is available, such as those containing south- or west-facing windows, are also areas that merit your attention.

Small Retrofit Focus: envelope measures — For HVAC systems to work efficiently, the building envelope must function as

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designed, by keeping the elements out. Leaks around windows and doors can significantly increase the work load on a building's HVAC system, especially in small to medium-sized buildings. Another "leaky" area that has to be considered are windows themselves. Single-pane windows (or even double-pane windows) without shading can heat up a room in no time. Windows properly treated with window film allow light, but not heat, to penetrate the window. This feature allows the occupant to use natural light over artificial light.

6 Keep the elements out

- Use caulks (see Table 1) and foam sealants to eliminate window and door leaks.
- Install blinds and shades and use them to reduce outside heat transfer, especially on west- and south-facing windows.
- Consider installing window films on west- and south-facing windows. (See Table 2 for criteria and manufacturers.)

► SMARTER USE OF EQUIPMENT

— Smarter use of equipment includes identifying areas and equipment that are not frequently used or have an irregular use pattern. Install sensors or institute use schedules so that equipment is turned off when it is not needed.

7 Use equipment only when needed

- Install occupancy sensors to turn off lights and other equipment when they are not in use (or daylight sensors to turn off lights when they are not needed).

Depending on the use pattern and location, occupancy sensors can pay for themselves in 3 years or less (see Tables 3 and 4).

8 Use less energy-intensive equipment

- Replace incandescent light bulbs with compact fluorescent

lamps (CFLs) in high-use areas (such as lobbies and hallways) and where lights are likely to be on for 24 hours a day (loading docks, outside lights, and exit signs, for example). In high-use areas, CFLs can pay for themselves in 1 to 2 years. (See Table 5 on Page 6.)

Continued on page 6

Table 3: Energy Savings from Using Sensors

AREA TYPE	# OF FIXTURES & WATTAGE	TIME ON (h)	ANNUAL COST (\$)	EST. % REDUCTION	# OF SENSORS & COST(\$)	PAY-BACK (months)
Bathroom	4, 320	24	280.32	0.50	1 @ 55.00	5
File room	8, 640	12	280.32	0.45	1 @ 65.00	6
Small work room	4, 320	12	140.16	0.40	1 @ 65.00	14
Corridors (60 ft)	10, 800	24	700.80	0.25	2 @ 70.00	10
Office (15 x 15)	3, 240	12	105.12	0.22	1 @ 60.00	31

Table 4: Selected Occupancy Sensors

COMPANY	MODEL	COVERAGE AREA	WARRANTY	LIST PRICE
Novitas Inc. 310-568-9600	01-200	300 sq. ft.	5 years	\$57.00
Sensor Switch 203-265-2842	WSDx	800 sq. ft.	5 years	\$47.60
Tech Design Ctr. 610-539-4210	LO300W-S	800 sq. ft.	3 years	\$55.00
Leviton MFG 800-323-8920	6775x	2700 sq. ft.	5 years	\$92.00
Sensor Switch 203-265-2842	WV-PDT	2000 sq. ft.	5 years	\$77.00
The WattStopper 408-988-5331	W-2000x	2000 sq. ft.	5 years	\$100.00

NOTE: For a complete list of recommended occupancy sensors, please refer to Green Seal's *Choose Green Report* on Occupancy Sensors.

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Table 5: Energy-Efficient Lamps

LAMP TYPE	APPLICATION(S)	COMMENTS
CFLs	Substitute for incandescents, exit signs	Long-lasting (5-7 years) & energy efficient (a 30 W CFL is equivalent to a 150 W incandescent, for example). In exit signs, CFLs use as little as 7-9 W per sign & can last well beyond 10,000 hours (1.5 years). Dimming CFLs are also now available.
Low temperature CFLs	Porch, sign, & compact flood lights. Lanterns and landscape lighting	Start at temperatures as low as -40°F, with proper electronic ballasts.
LEDs	Exit signs	Use less than 7 W per single-sided or 8 W per double-sided sign. Can last up to 20 years.
Full-sized fluorescent lamps(e.g. T-8s)	Offices, hallways, lobbies, production areas	Radiate light more efficiently with improved color character. Generally require electronic ballasts.
Halogen lamps	Areas where focused light is a priority, such as lobbies	Can be 10-50% more efficient than incandescent lamps.

NOTE: For more information on energy-efficient lamps, please refer to Green Seal's *Choose Green Report* on Energy Efficient Lighting.

Table 6: Selected Copier Products

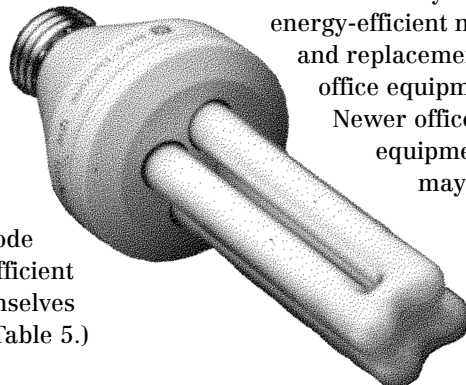
MANUFACTURER	MODEL	SPEED (cpm)	DUPLEX SPEED	DUPLEX TRAY CAPACITY
Xerox	220 DC	20	100%	No tray required
Panasonic	FP-7728	28	90%+	50
Xerox	230 DC	30	100%	No tray required
Panasonic	FP-7735	35	80% +	50
Ricoh	FT-5535	35	80% +	50
Mita	DC4090	40	90% +	50
Canon	NP-6045	45	90% +	50
Canon	6050	50	90% +	50

NOTE: For a more complete list of recommended copiers, please refer to Green Seal's *Choose Green Report* on Copiers.

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**10 Ways to Save Energy,
Continued from page 5**



■ Replace incandescent exit signs with more energy-efficient alternatives. These include CFLs, light strips, or light-emitting diode (LED) exit signs. Energy-efficient exit signs can pay for themselves in less than 2 years. (See Table 5.)



■ Purchase only energy-efficient new and replacement office equipment. Newer office equipment may have

features that help them use less energy. For example, ENERGY STAR computers, monitors, scanners, copiers and fax machines all have power-down features to save energy when not in use. In addition, use copiers with duplexing features.

Table 7: Green Seal Certified Air-Conditioning Systems

COMPANY		PRODUCTS	TYPE	COMMENTS
Carrier		Series 38TXA/550 AC, sizes: 024, 030, 036, 042, 048	Residential central-air-conditioning systems	13 SEER, high-efficiency systems use no CFCs.
Trane		Earth • Wise™ Centra®Vac-Models: CVHE 360-500; 560-800; CVHF 555-640; 650-910; 1060-1280, and CVHE, CVHF models w/Adaptive Frequency Drive	Electric Chillers	High energy efficiency, low ozone-depleting refrigerants and annual leakage rates of <1%. Model families are listed. Chillers available b/w 300-1400 tons capacity.

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► MORE EXTENSIVE PROJECTS

— A number of energy conservation projects require significant time and capital investments. These can payback significant savings, however, both directly and indirectly. For example, retrofitting with energy-efficient lighting, windows and office equipment can result in less thermal load, thus allowing the use of smaller HVAC equipment.

9 Reduce HVAC loads and tighten building envelope

■ If you have single-pane, aluminum frame windows or double-pane windows without thermal breaks, consider replacing them with double-pane, thermally broken windows. These measures are especially important if your heating season is longer than 3 to 4 months.

■ If you are in the south, southwest or other sunny location, consider light-colored roofing. Reflective coatings, membranes, or white gravel (in the case of a built-up roof), can significantly reduce roof temperature and your building's cooling needs.

■ Consider the use of radiant barriers if light-colored, reflective roofing is not a possible option. These are reflective films that can be installed in the attics of small to medium-sized buildings to help reflect heat away from living spaces.

10 Invest in more energy-efficient technologies

■ If you are in a small to medium-sized building, invest in more energy-efficient central AC units. A number of units available are 10 to 20% more efficient than ones available just a few years ago and they are priced competitively. Newer units are also more likely to use hydrofluorocarbons (HFCs) as refrigerants, which are not damaging to the ozone layer.

■ If you are in a larger building, consider a new chiller for the same reasons as above. Newer units are often cost-efficient. This is especially true when comparing life-time versus initial costs.

■ If a new chiller is not feasible at the moment, consider retrofitting

yours to use HCFCs or HFCs. The retrofit can make the chiller more efficient and eliminate your dependence on the supply of CFCs, which are scarce, expensive and damage the ozone.

■ If you have not already done so, upgrade your fluorescent lights to energy efficient T-8 lamps and electronic ballasts. They are not only more efficient, they are also quieter and generate less heat.

■ Investigate variable-speed blower motors and other efficient alternatives for your air-handling system.

For More Information

There are several programs available that will help save energy, improve efficiency, address environmental concerns, and save money. Among these are the EPA **Energy Star** Programs including: **Energy Star Homes**, **Energy Star Buildings**, **Energy Star Small Business**, and the **Green Lights Program**. These programs offer financial and marketing incentives to builders and developers. Home and office owners benefit from reduced energy costs, better energy-efficiency, and some financial incentives. For more information, you may call the US EPA's **Energy Star Homes Program** toll free at 888-STAR-YES or visit their web sites at www.epa.gov/energystar.html or www.epa.gov/greenlights.html.

SOME RADIANT BARRIER MANUFACTURERS

Environmentally Safe Products	800-289-5693
Innovative Insulation, Inc.	800-825-0123
Barricade Radiant Barriers (Simplex Products Division)	517-263-8881
Parsec Energy Research	800-527-3454
Innovative Energy	800-776-3645
Rmax Products	800-527-0890



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SUCCESS STORY

(Source: LBNL news release.)

Vice President Al Gore's National Performance Review has given a Hammer Award to a team of private and public entities who are working to turn San Francisco's Philip Burton Federal Building at 450 Golden Gate Avenue into a showcase of energy-efficient technologies. These technologies have the potential to cut billions of dollars from the federal government's annual energy bill.

The Hammer Award recognizes teams of federal, state, local employees and private citizens who have made government more efficient and effective. A study of

potential savings by the team's energy modeling specialists found that the new technology and control systems, which include, improved maintenance practices, lighting retrofits and other HVAC modifications, could reduce the Phillip Burton Federal Office Building's energy use by 25% at a cost savings of \$450,000 per year.

The team retrofitting the building consists of personnel from Lawrence Berkeley National Laboratory, the General Services



Administration (GSA), Pacific Gas & Electric Company, the National Institute of Standards and Technology (NIST) and Energy Simulation Specialists (ESS).

The Philip Burton Federal Building has 1.4 million square feet of space and is the largest federal building west of the Mississippi River. "Energy-saving technologies being demonstrated at the building potentially could save up to one-third of the federal government's annual energy bill of \$4 billion," says Dale Sartor, head of the Applications Team.